

REMARKS

Status of Claims

Claim 1 originally claimed a method for laser machining coated sheets to form at least one topographical change protruding from either the side facing the laser or the side opposite the laser, wherein

- (a) the topographical change is formed on the side of the sheet facing away from the laser beam, and/or
- (b) the laser beam describes a narrowing spiral about the center of its machining area.

Claims 1 and 7 are now amended to require the “narrowing spiral”. In view thereof, the “narrowing spiral” has been deleted from claims 5 and 6.

However, in claim 1 option (a) remains optional. That is, claim 1 requires that the laser beam describes a narrowing spiral about the center of its machining area, but permits the formed protrusion to be on either the same side as the laser beam (as claimed in claims 5) or on the opposite side (as claimed in claim 6).

It is noted that claim 8, reciting that the protrusion is on the side of the sheet facing the laser, recites the alternative embodiment to claim 7 (protrusion from side opposite to laser), thus claim 8 cannot depend from claim 7. The same-side embodiment having been claimed in claim 5, there is no need for claim 8, and claim 8 is canceled.

Claim 9 does not further limit claim 7, and is hereby canceled.

The specification has been amended to make explicit that the first illustrated embodiment (paragraph [0019] of the specification as published) concerns forming topographical changes on the laser facing side of the sheet. Further, the term “areal” not being a conventional term, this term has been changed to “diffuse”. It is more conventional terminology to say that defocusing of a laser beam provides a more diffuse and even warming of the machining area. Paragraph [0020] has been amended for the same reason.

Specification - 35 USC § 112

The Examiner indicates that under the first paragraph of 35 U.S.C. §112 the specification shall contain a written description of the invention.

In response, Applicants amend paragraph [00019] of the specification by incorporating language from original claims 1 and 8, to make explicit that the first

embodiment concerns formation of surface topographical changes on laser-facing side of the sheet. In the first embodiment, the laser is moved over machining areas, the "mountains" are formed, and then the second sheet is supplied and pressed to the first sheet for welding. In the second embodiment, two sheets are provided spaced apart, the mountains are formed on the first sheet on the side away from the laser, and the two sheets are pressed together for welding.

Claim Rejections - 35 USC § 112

Claim 8 is rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. According to the Examiner, claim 8 states "A method as in claim 7, wherein the surface from which said least one topographical change protrudes is the **side facing the laser.**" The claimed subject matter "side facing the laser" is not disclosed in the specification.

Further, claim 8 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In response, paragraph [00019] of the specification has been amended to make explicit that the first embodiment of the invention concerns formation of topographical changes on the side of the sheet facing the laser. Thus, the specification provides enabling teaching for the subject matter of the claims.

Withdrawal of the rejection is respectfully requested.

Claim Rejections - 35 USC § 103

Claims 1, 3-6 are rejected under 35 U.S.C. §103(a) as being unpatentable over FUJIMOTO et al (JP 2002-178178 A cited by applicant) in view of ISO et al (JP 2000-301374 A cited by applicant).

Fujimoto et al teaches (re claim 1) a laser lap welding method in which a protrusion 2a is formed, by melting, on the side sheet 2 facing away from laser 1. (See Drawing 1 and Paragraphs [0018]—[0020]) (re claim 3) the protrusion on the side facing away from the laser is welded to a second sheet so that the zinc vapor can escape through the gap formed by the protrusion. (See Drawing 2 and Paragraphs [0021]-[0024]) (re claim 4) the sheets 2 and 3 are fused together by welding which is performed by a second laser so the weld line is the same line as protrusion 2a. (See Paragraph [0026])

According to the Examiner, the case of claim 1 "the laser beam describes about the center of its machining area a narrowing spiral" is not given patentable weight since it is referred to in an alternative form.

In response, Applicants amend claim 1 as discussed above, i.e., to require that the laser beam describes a narrowing spiral about the center of its machining area (while claiming the formation of a topographic change on either the same side as the laser beam - as claimed in claim 5 - or on the opposite side - as claimed in claim 6).

Thus, this limitation must be given patentable weight. All claims are thus unobvious over Fujimoto et al.

Further, according to the Examiner, claims 5 and 6 are not given patentable weight since they refer to the alternative case of claim 1. MPEP 2111.04 states "Claim scope is not limited by claim language that suggests or make optional but does not require steps to be performed, or by claim language that does not limit a claim to a particular structure."

In response, applicants point out that claims 5 and 6 must be examined on their own merits. These claims do not recite the alternative forms, only one form, and that form is to be examined. Nevertheless, amendment of claim 1 renders this point of rejection moot.

Next, the Examiner acknowledges that Fujimoto et al fails to teach (re claim 1) a laser directing a laser beam onto the surface by means of a scanner device.

Iso et al teaches (re claim 1) a scanner for directing the laser beam wherein "a laser beam is introduced into the 1st galvanoscanner 14, and while branching introduces the laser beam of another side into the 2nd galvanoscanner 16 by the mirror 15. The structure of galvanoscanner is provided with the 2nd galvanomirror for making the laser beam from the 1st galvanomirror and this 1st galvanomirror for making a laser beam shake at an X axial direction shake at Y shaft orientations further as everyone knows. Thus, the laser beam which came out of the 1st and 2nd galvanoscanner is irradiated on the work 20 through the f-theta lenses 17 and 18, respectively." (See Paragraph [0013])

In view of Iso et al's teachings it would have been obvious to one of ordinary skill in the art at the time of the invention to include, the scanner means for directing the laser beam, since it is known in the art that a scanner device can be used for directing a laser beam to provide a greater working speed of the laser beam (see paragraph 5, 9 and 31 of Iso et al).

Applicants respectfully traverse in view of the claims as presently amended to require that the laser beam is guided to describe about the center of its machining area a narrowing

spiral, whereby the laser beam generates the at least one projecting topographical change on the laser beam facing side of the sheet, or on that side of the at least one sheet which faces away from said beam by melting through this sheet in the region of its machining area.

Fujimoto et al. do not suggest a technique for forming a topographical change projecting from the surface comprising guiding a laser beam to describe a narrowing spiral about the center of its machining area, and Iso et al teaching of a mirror to make positioning of the laser beam faster does not remedy the deficiency of Fujimoto et al. as to forming a projecting topographical change by guiding the laser beam to describe about the center of its machining area a narrowing spiral.

The person of ordinary skill in the art, even if he could find some reason to combine these references, would not find the present invention within the combined teachings of these references.

Next, claim 2 ("wherein the laser beam is not focused upon the surface") is rejected under 35 U.S.C. §103(a) as being obvious over Fujimoto et al as modified by Iso et al as applied to claims 1, 3-4 above, and further in view of Milewski et al (US Patent No. 5,760,365).

Milewski et al is cited for teaching e.g. "Focusing above the surface of the aluminum part" (See column 12, lines 33-34). According to the Examiner, in view of Milewski et al's teachings it would have been obvious to focus the laser beam at a point other than at the surface of the material to melt one side of the material, since it is known in the art to defocus the laser beam in an analogous process for the same purpose.

In response, Applicants point out that this combination of references does not teach guiding a laser such that the laser beam is guided to describe about the center of its machining area a narrowing spiral, whereby the laser beam generates the at least one projecting topographical change on the laser beam facing side of the sheet, or on that side of the at least one sheet which faces away from said beam by melting through this sheet in the region of its machining area – and wherein the laser beam is not focused upon the surface.

Withdrawal of the rejection of claim 2 is respectfully requested.

Claims 7-9 are rejected under 35 U.S.C. §103(a) as being obvious over Fujimoto in view of Leong et al (US Patent No. 6,329,635).

The Examiner acknowledges that Fujimoto et al fail to teach (re claim 7) wherein said melting through is controlled by pre-specifying the processing time or by providing a penetration sensor which regulates the laser machining time.

The Examiner again indicates that the case of claim 1 "the laser beam describes about the center of its machining area a narrowing spiral" is not given patentable weight since it is referred to in an alternative form. Therefore claims 5 and 6 are not given patentable weight since they refer to the alternative case of claim 1.

In response, Applicants point out that claim 1 has been amended as discussed above, i.e., to require that the laser beam describes a narrowing spiral about the center of its machining area (while claiming the formation of a topographic change on either the same side as the laser beam - as claimed in claim 5 - or on the opposite side - as claimed in claim 6).

Thus, this limitation must be given patentable weight. All claims are thus unobvious over the cited combination of references.

Finally, the Examiner indicates that prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Alips et al (US Patent No. 6,914,213) teaches an analogous method wherein the laser beam is focused above and below the surface of the sheet.

Spies et al (US Patent No. 5,104,032) teaches an analogous method.

Wang et al (US Patent No. 6,646,225) teaches a method for machining then welding galvanized steel using a laser beam.

Wais et al (US Patent No. 7,123,632) teaches an acousto-optical modulator in a laser beam source.

Burrows et al (US Patent No. 5,434,880) teaches an acousto-optical modulator enabling an optical head.

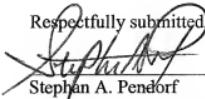
Applicants have reviewed these references, find therein no disclosure more pertinent than already discussed, and have no further comments.

The Commissioner is hereby authorized to charge any fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account Number 16-0877.

Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.

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Respectfully submitted


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